

Energy Resources Division  
List of Recent Publications by Group

Some of the listed papers may be available directly from the BNL researcher. To inquire, please send an email to Sue Walch ([walch@bnl.gov](mailto:walch@bnl.gov)). In each paper the name of the key BNL researcher is in bold font. Contact information for anyone at BNL can be found using the “People Search” function at the top, left corner of the BNL home page: [www.bnl.gov](http://www.bnl.gov)

## **Renewable Energy Projects Group**

**C.R. Krishna.** Low cost Bioheating Oil Application. Informal Report, May 2003.

**Toshifumi Sugama.** Nanoscale Boehmite Filler for Corrosion- and Wear-resistant Polyphenylenesulfide Coatings. Informal Report, June 2003.

**T. Sugama,** L. Weber and L.E. Brothers. Ceramic Fibre-reinforced Calcium Aluminate/fly Ash/polyposphate Cements at a Hydrothermal Temperature of 280°C. *Advances in Cement Research*. Vol. 14, No. 1, 25-34, January 2002.

**T. Sugama** and L. E. Brothers. Citric Acid as a Set Retarder for Calcium Aluminate Phosphate Cements. Informal Report, January 2005.

**Toshifumi Sugama.** Recycled Waste-based Cement Composite Patch Materials for Rapid/Permanent Road Restoration. Informal Report, January 2005.

**T. Sugama** and L.E. Brothers. Sodium-silicate-activated Slag for Acid-resistant Geothermal Well Cements. *Advances in Cement Research*, Vol. 16, No. 2, 77-87. April 2004.

**T. Sugama,** R. Sabatini and K. Gawlik. Self-assembly Ce Oxide/Organopolysiloxane Composite Coatings. Informal Report, January 2005.

**T. Sugama,** L.E. Brothers and D. Kaspereit. *Cement & Concrete Composites*, Vol. 25, p. 758-768, 2005.

**T. Sugama,** L.E. Brothers, and T.R. Van de Putte. Air-foamed Calcium Aluminate Phosphate Cement for Geothermal Wells, *Cement & Concrete Composites*, 27, 758-768, 2005.

**T. Sugama,** L.E. Brothers, and T.R. Van de Putte. Acid-resistant Cements for Geothermal Wells: Sodium Silicate Activated Slag/fly Ash Blends, Vol. 17, No. 2, 65-75, April 2005.

**T. Sugama** and D. Jung. Polytetrafluoroethylene-rich Polyphenylenesulfide Blend Top Coatings for Mitigating Corrosion of Carbon Steel in 300°C Brine. Informal Report, June 2005.

**T. Sugama**, L.E. Brothers, and T.R. Van de Putte. Effect of Quartz/Mullite Blend Ceramic Additive on Improving Resistance to Acid of Sodium Silicate-activated Slag Cement. Informal Report, June 2005.

**Toshifumi Sugama**. Polyethersulfone Coating for Mitigating Corrosion of Steel in Geothermal Environment. Informal Report, November 2005.

**Toshifumi Sugama** and Keith Gawlik. Polyphenylenesulfide/Montmorillonite Clay Nanocomposite Coatings: Their Efficacy in Protecting Steel Against Corrosion. Informal Report, November 2005.

M.L. Berndt. Sustainable Concrete for Wind Turbine Foundations. Informal Report, June 2004.

### **Advanced Fuels and Process Science Group**

Alon Amrani, Eli Tannenbaum, Michael Lewan, **Appathurai Vairavamurthy**, and Zeev Aizenshtat. Carbon and Sulfur Transformations in Hydrous Pyrolysis Experiments of Senonian (Ghareb) Bituminous Rock: Source of Dead Sea Area Asphalts and Oil Shales? Presented at the 22<sup>nd</sup> International Meeting on Organic Geochemistry, Seville, Spain, September 12-16, 2005.

M. Anjom, B. Dong, S.A. Van Ooteghem, D. van der Lelie, S. Taghavi, and **D. Mahajan**. Biological Processing of Carbonaceous Sources Using Extremophiles for CO<sub>2</sub>-Neutral Ultra-Pure Hydrogen Production. 5<sup>th</sup> Topical Conference on Natural Gas Utilization Advanced Gas Conversion and Hydrogen Production. AIChE Spring National Meeting, Atlanta, GA. April 10-14, 2005

Benjamin C. Bostick, Kevin M. Theissen, Robert B. Dunbar and **Murthy A. Vairavamurthy**. Record of Redox Status in Laminated Sediments from Lake Titicaca: A Sulfur K-edge X-ray Absorption Near Edge Structure (XANES) Study, Chemical Geology, Vol. 219, 163-174, 2005).

Q.-S. Chen, **J. Wegrzyn**, and V. Prasad. Analysis of Temperature and Pressure Changes in Liquefied Natural Gas (LNG) Cryogen Tanks, Cryogenics, Vol. 44, 701-709, 2004.

Sunkyoung Choi, Peggy A. O'Day, Nelson A. Rivera, Karl T. Mueller, **Murthy A. Vairavamurthy**, Supapan Seraphin, and Jon Chorover. Strontium Speciation during Reaction of Kaolinite with Simulated Tank-waste Leachate: Bulk and Microfocused EXAFS Analysis. Submitted to Environmental Science & Technology, August 2005.

M. Eaton, **D. Mahajan**, R. Flood, T. Koga, and M. Rafailovich. Hydrate-Sediment Interactions in a Novel High-Pressure Apparatus. Symposium on Gas Hydrates and Clathrates. Co-sponsored by the ACS Petroleum Chemistry and Fuel Divisions. 229<sup>th</sup> ACS National Meeting, San Diego, CA. March 13-17, 2005.

Eaton, **D. Mahajan**, R. Flood, T. Koga, and M. Rafailovich. A Novel High-Pressure Apparatus to Study Hydrate-Sediment Interactions. J. Pet. Sci. & Eng. **Accepted**.

**Jason Graetz** and James J. Reilly. Nanoscale Energy Storage Materials Produced by Hydrogen-Driven Metallurgical Reactions. *Advanced Engineering Materials*, Vol. 7, No. 7, 597-601, 2005.

**J. Graetz**, Y. Lee, J.J. Reilly, S. Park and T. Vogt. Structures and Thermodynamics of the Mixed Alkali Alanates. *Physical Review*, B 71, 184115-1–184115-7, 2005.

**J. Graetz**, A. Yu Ignatov, T.A. Tyson, J.J. Reilly, and J. Johnson. Characterization of the Local Titanium Environment in Doped Sodium Aluminum Hydride using X-ray Absorption Spectroscopy. Conference proceedings of the Materials Research Society Fall Meeting, Boston, MA, 2004.

**J. Graetz**, J.J. Reilly, and J. Johnson. X-ray Absorption Study of Ti-activated Sodium Aluminum Hydride. *Applied Physics Letters*, Vol. 85, No. 3, 500-502, 2004.

K. W. Jones, H. Feng, and **D. Mahajan**. Mapping Metal Catalysts Using Synchrotron Computed Microtomography and Micro X-ray Fluorescence. Symposium on Synthetic Clean Fuels from Natural Gas and Coal-bed Methane: 30 Years Since First Oil Crisis. Co-sponsored by the ACS Fuel and Petroleum Chemistry Divisions. 226<sup>th</sup> ACS National Meeting, New York, NY. September 7-11, 2003.

**Jason Graetz** and James J. Reilly. Nanoscale Energy Storage Materials Produced by Hydrogen-Driven Metallurgical Reactions. *Advanced Engineering Materials*, No. 7, 2005.

K.W. Jones, H. Feng, S. Tomov, W. J. Winters, Michael Eaton, and **D. Mahajan**. Morphology of methane hydrate host sediments. Symposium on Gas Hydrates and Clathrates. Co-sponsored by the ACS Petroleum Chemistry and Fuel Divisions. 229<sup>th</sup> ACS National Meeting, San Diego, CA. March 13-17, 2005.

K. W. Jones, H. Feng, A. Lanzirotti, and **D. Mahajan**. Synchrotron X-ray Microprobe and Computed Microtomography for Characterization of Nanocatalysts. **Nuclear Instruments and Methods in Physics Research B. December 2005**.

K. W. Jones, H. Feng, L. Lanzirotti, and **D. Mahajan**. Mapping Metal Catalysts Using Synchrotron Computed Microtomography (CMT) and Micro X-ray Fluorescence ( $\mu$ XRF). **Topics In Catal.**, 263-272 (2005).

H. Khalil, **D. Mahajan**, M. Rafailovich, M. Gelfer, and K. Pandya. Synthesis of Nanophase Metal Particles Stabilized with Polyethylene Glycol. **Langmuir. Vol. 20**, 6896-6903 (2004).

H. Khalil, **D. Mahajan**, and M. Rafailovich. *Polymer-Montmorillonite Clay Nanocomposite. Part I. Complexation of Montmorillonite Clay with A Vinyl Monomer*. **Polymer Internat. 54** 428-36 (2005).

H. Khalil, **D. Mahajan**, and M. Rafailovich. *Polymer-Montmorillonite Clay Nanocomposite. Part II. The Use of Montmorillonite Clay-Vinyl Monomer Complex As A Comonomer in the*

*Copolymerization Reaction of Styrene-Acrylonitrile Monomers. Polymer Internat. Vol. 54, 423-27 (2005).*

**D. Mahajan**, A. Desai, M. Rafailovich, M-H. Cui, and N-L. Yang. Synthesis and Characterization of Nano-Sized Metals Embedded In Polymer Matrix. **Composites Part B: Engineering. 37** 74 - 80 (2006).

**D. Mahajan**, M. Anjom. D. van der Lelie, and S. Taghavi. Application of Nanocomposites In Biomimetic Hydrogen Production. 12<sup>th</sup> International Conference on Composites and Nano Engineering (ICCE-12), Tenerife, Spain. August 1-6, 2005

**D. Mahajan**. Atom-Economical Reduction of Carbon Monoxide to Methanol Catalyzed by Soluble Transition Metal Complexes at Low Temperatures. **Topics In Catal. 209-214 (2005).**

**D. Mahajan**, P. Servio, K.W. Jones, H. Feng, W.J. Winters. **2005**. Methane hydrate studies: delineating properties of host sediments to establish reproducible decomposition kinetics. Chapter 16 in Advances in the Studies of Gas Hydrates, C. E. Taylor and J. T. Kwan, Editors, pp. 239-250, Kluwer Academic Publishers, Inc., New York, New York. [**Book Chapter**].

**D. Mahajan**. Efficient Production of Purified Hydrogen Via Low Temperature Water-Gas-Shift (WGS) Reaction . Presented at the Symposium on Advanced Gas Conversion and Hydrogen Production, 2004 AIChE Spring National Meeting, Abstract # 72b, New Orleans, LA. April 25-29, 2004.

**D. Mahajan**, E.T. Papish, and K. Pandya. *Sonolysis Induced Decomposition of Metal Carbonyls: Kinetics and Product Characterization. Ultrasonic. Sonochem. 11(6)* 385-392 (2004).

**D. Mahajan**, CL Marshall, N. Castagnola, and JC Hanson. *Sono Synthesis and Characterization of Nanophase Molybdenum-Based Materials for Catalytic Hydrodesulfurization. Appl. Catal. A: General. 258* 83-91 (2004).

**D. Mahajan**, M. Rafailovich, M.-H. Cui, and N.-L. Yang. Synthesis of Polymer Encapsulated Nano Metal Catalysts. The 4<sup>th</sup> DOE National Laboratory Catalysis Conference (NLCat 2003), Oak Ridge, TN. October 22-24, 2003

**D. Mahajan**. Sono-synthesis and characterization of nanophase hydrodesulfurization catalysts", Presented at the Symposium on "Catalysts and Processes for Environmentally-Cleaner Gasoline and Diesel Fuels", Division of Fuel Chemistry, 226<sup>th</sup> ACS National Meeting, New York, NY, September 7-11, 2003.

**D. Mahajan**. Atom-Economical Reduction of Carbon Monoxide to Methanol: Is the Catalyst Single-Site or Multi-Site. Symposium on Synthetic Clean Fuels from Natural Gas and Coal-bed Methane: 30 Years Since First Oil Crisis. Co-sponsored by the ACS Fuel and Petroleum Chemistry Divisions. 226<sup>th</sup> ACS National Meeting, New York, NY. September 7-11, 2003.

**D. Mahajan**, A. Desai, H. Khalil, M.H. Rafailovich, and N.-L. Yang. Synthesis and Characterization of Nano-Sized Materials In Polystyrene Matrix. 10<sup>th</sup> International Conference on Composite Engineering (ICCE-10), New Orleans, LA. July 20-26, 2003.

**D. Mahajan**, C.L. Marshall, A.J. Kropf, M. Serban, N. B. Castagnola, and J.C. Hanson. Sono-Synthesis and Characterization of Nanophase Hydrodesulfurization Catalysts. 18th North American Catalysis Society Meeting, Cancun, Mexico. June 1-6, 2003

**D. Mahajan**, P. Gütlich, and U. Stumm. Fischer-Tropsch Synthesis With Nano-Sized Iron Particles In Slurry Phase. Presented at the 3<sup>rd</sup> Topical Conference on Natural gas Utilization, 2003 AIChE Spring National Meeting, **Abstract # 77d**, New Orleans, LA March 30 - April 3, 2003.

**D. Mahajan**, K. W. Jones, H. Feng, and W. J. Winters. Methane Hydrate Studies: Delineating Properties of Sediments Using Synchrotron Computed Microtomography (CMT). Presented at the Symposium on Gas Hydrates, 2003 AIChE Spring National Meeting, **Abstract # 78a** New Orleans, LA March 30- April 3, 2003.

**D. Mahajan**, P. Gütlich, J. Ensling, K. Pandya, U. Stumm, and P. Vijayaraghavan. *Evaluation of Nano-Sized Iron in Slurry-Phase Fischer-Tropsch Synthesis*. **Energy & Fuels** 17 1210 -1221 (2003).

**D. Mahajan** and A. N. Goland. *Integrating Low Temperature Methanol Synthesis and CO<sub>2</sub>-Sequestration Technologies: Application to IGCC Plants*. **Catal. Today**. 1/2 71-81 (2003).

**D. Mahajan**, P. Gütlich, and U. Stumm. *The Role of Nano-Sized Iron Particles in Slurry-Phase Fischer-Tropsch Synthesis*. **Catal. Commun.** 4 101-107 (2003).

S. A. Van Ooteghem, A. Jones, D. van der Lelie, B. Dong, **D. Mahajan**. H<sub>2</sub> Production and Carbon Utilization by *Thermotoga Neapolitana* Under Anaerobic and Microaerobic Growth Conditions. **Biotech. Lett.** 26 1223-32 (2004).

M. Rafailovich, T. Koga, Y.S. Seo, **D. Mahajan**, B. Chu, and J. Sokolov. Neutron Reflectivity Studies of the Gas/Solid/Liquid Interface. Symposium on Synthetic Clean Fuels from Natural Gas and Coal-bed Methane: 30 Years Since First Oil Crisis. Co-sponsored by the ACS Fuel and Petroleum Chemistry Divisions. 226<sup>th</sup> ACS National Meeting, New York, NY. September 7-11, 2003.

M. Rafailovich, T. Koga, Y-S Seo, J. Sokolov, **D. Mahajan**, and S. Satija. Surface Modification of Polymeric Nanocomposite Thin Films Using Supercritical Carbon Dioxide. **Topics In Catal.** 257-262 (2005).

Gary Sandrock, James Reilly, Jason Graetz, Wei-Min Zhou, John Johnson, and **James Wegrzyn**. Accelerated Thermal Decomposition of AlH<sub>3</sub> for Hydrogen-fueled Vehicles. *Applied Physics A*, Vol. 80, 687-690, 2005.

P. Servio and **D. Mahajan**. Kinetic Reproducibility of Methane Production from Methane Hydrates. Symposium on Synthetic Clean Fuels from Natural Gas and Coal-bed Methane: 30 Years Since First Oil Crisis. Co-sponsored by the ACS Fuel and Petroleum Chemistry Divisions. 226<sup>th</sup> ACS National Meeting, New York, NY. September 7-11, 2003.

P. Servio, M. Eaton, **D. Mahajan**, and W.J. Winters. Fundamental Challenges to Methane Recovery from Gas Hydrates. **Topics In Catal.** 101-108 (2005).

**Appathurai Vairavamurthy**, Anatoly Frenkel, Bernard Manowitz, Frank Mango and Sayed Khalid. X-ray Absorption spectroscopic Speciation of Nickel in Organic Shales: Implications for Catalysis in Natural Gas Generation. Submitted to Chemical Geology, August 2005.

N.-L.Yang, A. Desai, **D. Mahajan**, and M. Rafailovich. Synthesis and Characterization of Nano-sized Iron Partilces on a Polystyrene Support as Potential Fischer-Tropsch Catalysts. Symposium on Synthetic Clean Fuels from Natural Gas and Coal-bed Methane: 30 Years Since First Oil Crisis. Co-sponsored by the ACS Fuel and Petroleum Chemistry Divisions. 226<sup>th</sup> ACS National Meeting, New York, NY. September 7-11, 2003.

## **Energy Efficient Buildings Group**

**Tutu, N.**, Krishna, C., and Butcher, T. Characterization of Airflows at the Exit of Registers Using Laser Doppler Velocimetry (LDV). ASHRAE Transactions, 2004, Vol 110, Part 2.

**Andrews, J.W.** 2003. Effect of Airflow and Heat Input Rates on Duct Efficiency. ASHRAE Transactions, Vol. 109, Pt. 2, pp. 413-424.

Horne, W.E., Morgan, M., Sundaram, V. (Edtek, Inc.), and **Butcher, T.** A 500 watt diesel-fueled TPV portable power supply. Proceedings of the Fifth Conference on Thermophotovoltaic Generation of Electricity, Rome, September 15-19, 2002.

**Butcher, T.**, Krishna, C.R., Celebi, Y., Wei, G., Lee, S.W., Kamath, B., and Albrecht, R. Progress in small burner development research, Proceedings of the Aachen Colloquim, Aachen, Germany, September 18-19, 2003.

**Butcher, T.** Condensing Boilers and Baseboard Hydronic Distribution Systems. accepted for publication in ASHRAE Transactions, 2006.

**Butcher, T.**, Park, N., Litzke, W.L. Condensing economizers: thermal performance and particulate removal efficiencies. Two-Phase Flow and Heat Transfer - 1992. American Society of Mechanical Engineers HTD-Vol. 197, 1992.

**Roger J. McDonald.** Proceedings of the 2003 National Oilheat Research Alliance Technology Symposium. 2003 New England Fuel Institute Convention & 30<sup>th</sup> North American Heating Convention Center, Boston, Massachusetts, June 9-10, 2003.

**Roger J. McDonald.** Proceedings of the 2004 National Oilheat Research Alliance Technology Symposium. Oilheat Visions Conference, Rhode Island Convention Center, Providence, Rhode Island, August 23-24, 2004.

A. Naidja, **C.R. Krishna**, T. Butcher, and D. Mahajan. *Cool Flame Partial Oxidation and Its Role in Combustion and Reforming of Fuels for Fuel Cell systems*. **Prog. Energy & Combust. Sci.**, 29 155 - 191 (2003).

**Andrews, J.W.** 2002. Duct Retrofit Strategy to Complement a Modulating Furnace. BNL Informal Report

**Andrews, J.** Better Duct Systems for Home Heating and Cooling. BNL Informal Report.

**Andrews, J.** How to Heat and Cool a Home with 400 CFM Supply Air and Keep the Ducts in the Conditioned Space, BNL Informal Report, 1999.

**John W. Andrews.** Effect of Airflow and Heat Input Rates on Duct Efficiency. Informal Report, May 2003

**John W. Andrews.** Laboratory Evaluation of the Delta Q Test for Duct Leakage. Informal Report, May 2003.

**John W. Andrews.** A History of ASHRAE Standards 152P. Informal Report, February 2004.

**John W. Andrews.** Energy Savings Potentials in Residential and Small Commercial Thermal Distribution Systems – An Update. Informal Report, February 2004.

**John W. Andrews.** Future Directions for Thermal Distribution Standards. Informal Report, February 2004.

John E. Batey and **Roger J. McDonald.** Low Sulfur Home Heating Oil Demonstration Project, Summary Report. June 2005.

**Thomas A. Butcher.** Hydronic Baseboard Thermal Distribution Systems with Outdoor Reset Control to Enable the Use of a Condensing Boiler. Informal Report, October 2004.

**C.R. Krishna**, Thomas A. Butcher and Bola R. Kamath. Variable Firing Rate Oil Burner using Pulse Fuel Flow Control. Informal Report, October 2004.

**C.R. Krishna.** Sealed Combustion System with Diagnostic Self-tuning. Informal Report, September 2004.

C.R. Krishna and **Thomas Butcher.** Low NO<sub>x</sub> Burner Development. Informal Report, September 2004.

**Wai-Lin Litzke.** A Guide to Fuel Performance. Informal Report, January 2005.

